USMC Software Reprogrammable Payload

ONR Program Code 30 | November 2010

At a Glance

What is it?

- The Software Reprogrammable Payload (SRP) is an open-architecture, government owned reference design for a flexible, in-operational reconfigurable software radio designed to meet current and future needs for USMC UAS systems supporting a wide variety of missions

How does it work?

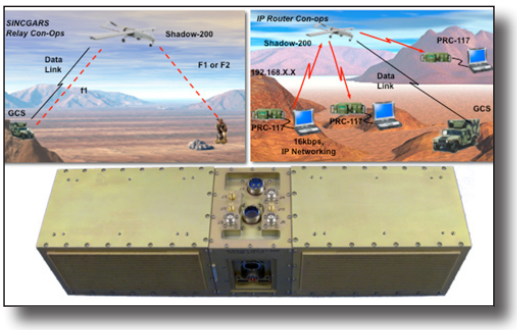
- Using modern software radio technology based on leading-edge components used in the wireless industry, collect, process, and transmits signals.
- Optimizing the application development process and location of processing between the field programmable gate array (FPGA) and the general purpose processor (GPP), achieve high reliability and throughput for a variety of applications
- Integrated with external components such as power amplifiers and antennas which may be indigenous on a particular platform, the SRP forms the core of a radio communications and ISR system

What will it accomplish?

- Provide the USMC with robust, flexible, reconfigurable payload operation with their Shadow UAS
- Four baseline applications are part of the initial capability: automated identification system; UHF communications relay with interference mitigation; UHF IP router capability for legacy radios; SINCGARS relay; and additional applications are on a parallel development path.

Point of Contact

Christopher Huffine
huffine@nrl.navy.mil



The USMC SRP effort started to satisfy urgent needs to improve battlefield comm. The app-oriented modular design allows the SRP to support a wide variety of requirements to include ISR, Electronic Warfare, and other processing and data handling functions.

The initial capability of SRP to the Marine Corps Shadow includes a jam resistant IP Router for netted communications on the move and a SINCGARS Relay that are both fully compatible with the current inventory of tactical radios. In addition, the SRP provides an RF collection application for the Automatic Identification System used for vessel tracking.

During a typical mission, the operator can use a simple drag-and-drop interface to select an application while on route to a convoy surveillance support mission. Once on station, the payload could do SIGINT collection while simultaneously performing beyond-line-of-sight UHF communications relay. If interference is detected on the communications channel the operator can select an interference mitigation filter, applied similarly to a Photoshop filter, or reprogram the communications channel form a pre-selected frequency plan.

Two key elements of the SRP are its non-proprietary design and a software developer's tool kit that enables the widest community to develop applications. Non-proprietary, government defined standards, and government-owned applications reduce the cost of acquisition by "solving the problem once." Department of Defense acquisition programs benefit from efficiency of re-use when applications developed for one platform may be rehosted on another without re-inventing common components and functions. The software development tool kit can be provided to academia, industry, and government laboratories and thereby stimulate innovation and competition to bring new and effective communications and collection applications to the Marine Corps.

The delivery of the USMC Shadow SRP is the completion of the "initial capability." Additional pre-planned product improvements (P3I) are in the pipeline with new capabilities coming online over the next two years. Several demonstrations are planned in the future, including UAS platforms as well as manned systems for both USMC and Navy requirements

Research Challenges and Opportunities:

- Modularization of low-level field programmable gate array software to increase portability from architecture to architecture
- Increasing the efficiency of power amplifier systems using pre-distortion techniques to lower the total power required in complex multi-carrier systems
- Streamlining application development process to allow maximal leveraging of current capabilities